I-SERIES ICE MACHINE TRAINING MANUAL

CARBON DIOXIDE

WATER

SYRUP/CONCENTRATE

MECHANICAL

REFRIGERATION

CONTROLS & ELECTRICAL

Distributed By:
Commercial Refrigeration Service, Inc.
WWW.IceCubes.NET
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TECHNICAL SERVICES

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I-Series Ice Machine Training Manual

The products, technical information, and instructions contained in this manual are subject to change without notice. These instructions are not intended to cover all details or variations of the equipment, nor to provide for every possible contingency in the installation, operation or maintenance of this equipment. This manual assumes that the person(s) working on the equipment have been trained and are skilled in working with electrical, plumbing, pneumatic, mechanical, and refrigeration equipment. It is assumed that appropriate safety precautions are taken and that all local safety and construction requirements are being met, in addition to the information contained in this manual.

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NOTES:

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INTRODUCTION

1. PREVIEW QUESTIONS

Check your current knowledge by taking a few minutes to answer the following questions:

1. Does the ice machine need to be level?

   _____ Yes _____ No?

2. What is the recomended clearance for a air cooled machine? _____

   _____

   _____

3. What kind of cleaner should be used when cleaning this ice machine? _____

   _____

   _____

4. Water filters are required in most installations.

   _____ True _____ False?

5. Water regulators are required in most installations.

   _____ True _____ False?

2. KEY THINGS TO KNOW / DO

- The sealant should be added before the unit is placed on the dispenser on bin. Always seal the ice maker to the bin (with a gasket or food grade sealant). Sealing prevents melted ice from running out the joint between the ice machines!

- Choose the proper condenser for the application:
  Air — with sufficient clean air circulation
  Water — high ambient temperature or dusty environment, restricted air flow, or where extra BTUs are unwanted
  Remote — when heat or noise are a problem!

- Always refer to serial plate for electrical power requirements and refrigeration charge and type of refrigerant!

Note serial plate locations. Lower lefthand corner of cabinet inside the unit, on the bulkhead between the evaporator and the compressor.

- Always use proper size and type of water conditioning equipment (filter, chlorine, etc.)!

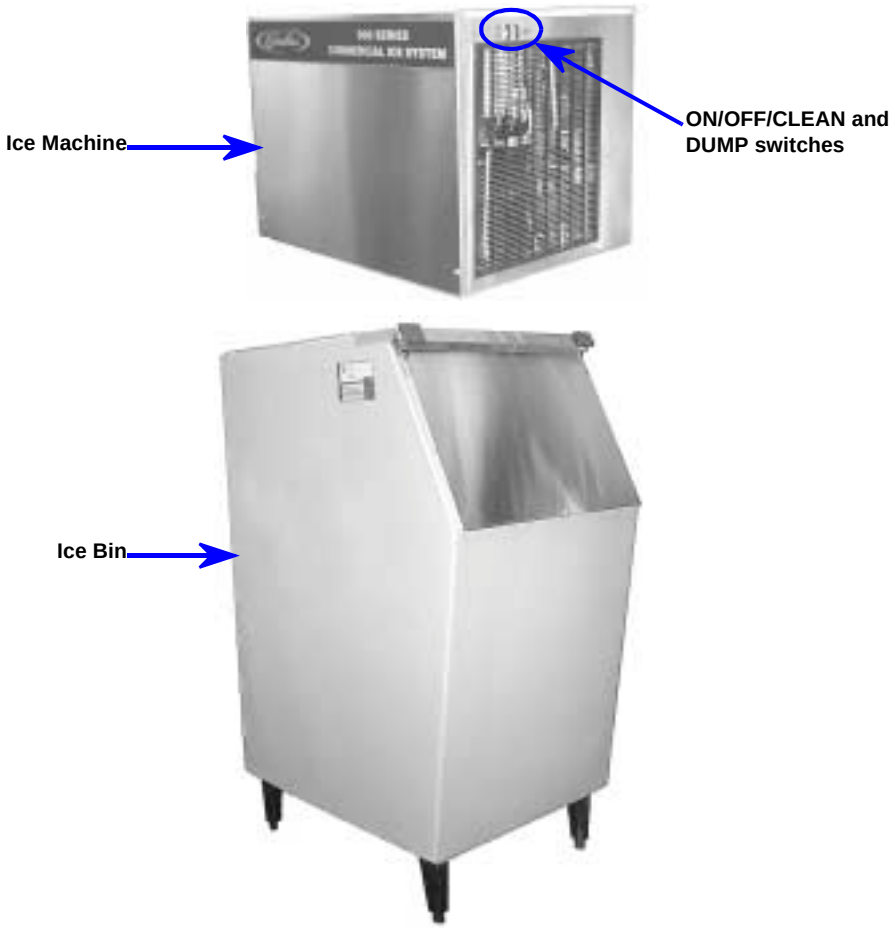
- Do NOT use softened or reverse osmosis water!

- Premature harvest is normally caused by a defect in suction line sensors! "I" series units only.

- Installation of a bin thermostat control is required in some installations, such as ice drink dispensers or ice drink units!

- Bin stat is available to lower ice level! Part No. 630000-408

3. OVERVIEW



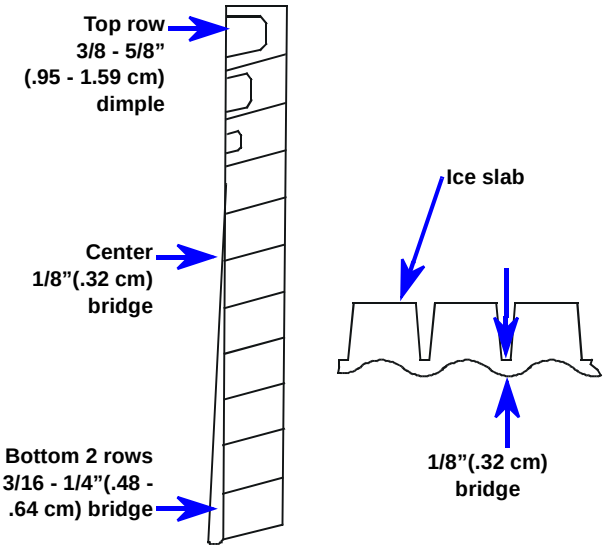
3.1 Product Description

The normal sequence of events for starting the I-Series Ice Machine is as follows:

1. The ON-OFF-CLEAN switch is switched ON.
2. Controller board does a startup check.
3. After 4 seconds the contactor closes and the compressor starts.
4. When the condenser thermistor reaches 100° F (38° C), the fan starts. The fan stops when the thermistor drops to 88° F (31° C).
5. When the suction line thermistor reaches 20° F (-7° C), the water pump starts.

6. Ice builds on the evaporator to about 1/8” (.32cm) bridge thickness (center measure, adjustable). When the hot-gas defrost valve opens, the water dump valve opens, and the pump motor runs for 15 seconds to expel the waste water.

NOTE: The hot-gas defrost valve opens at approximately 0° F (-18° C), and can be adjusted by turning the ice thickness potentiometer.



7. Ice drops from the evaporator and opens the curtain proximity switch.
8. After the ice drops into the bin, the curtain proximity switch close. The defrost stops and the ice making process starts over.
9. If the ice does not drop into the bin because the bin is full, the defrost will continue for approximately 8 seconds and stop. The ice machine then waits for the ice to fall into the bin and the curtain and proximity switches to close.

3.2 Dimensions & Capacities

Ice Machine:

Ambient operating temperature:- - - - - - - - - - - - - - - - 50-100° F (10-38° C)

Water: - - - - - - - - - - - - - - - - - - 20-50 psi (1.4-3.45 BAR) at the ice machine.
- - - - - - If the water pressure exceeds 50 p.s.i. install a water pressure regulator

Electrical: - see unit’s name plate

SYSTEM DETAILS

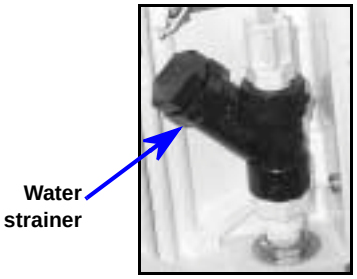
1. Carbon Dioxide/Air

Not applicable for this product.

2. Water

+ NOTE: Water related issues are the cause of the majority of ice maker problems.

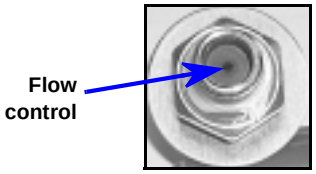
NOTE: Always use the proper type and size of water filter



Inlet pressure should be 20 to 50 psi (1.4-3.45 BAR) at the ice machine.

Water goes first to a strainer. The strainer screen should be removed and cleaned at least once per year.

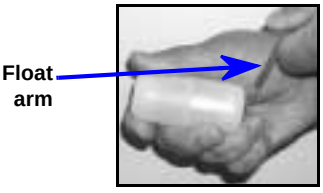
There is a rubber flow control washer in the base of the float valve. This flow control can be become plugged or deteriorated by chloramine. It should be checked at least once per year, and replaced if necessary. Be sure to install the flow control washer flat side up.



NOTE: The flow control should be removed when the water pressure is below 20 psi (1.4 BAR).

NOTE: If water pressure is above 50 psi (3.45 BAR) add a pressure regulator.

The operating water level can be changed by bending the float arm.

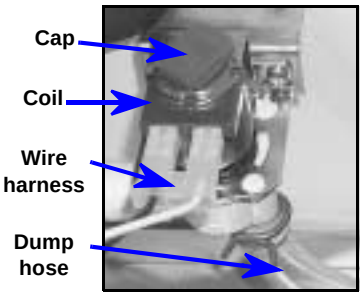


NOTE: Make sure the float moves up and down freely after it has been reinstalled.

A splash shield has been installed above the float on all machines built since June of 1998. A splash shield kit is available for older machines (part number for 1 evaporator = 630000234, 2 evap. = 630000232, 4 evap. = 630000233). See Service Bulletin # TB97108 for additional information.

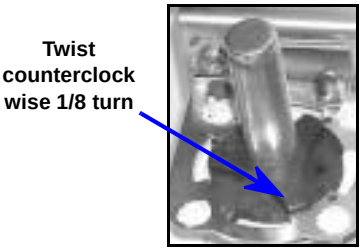
2.1 Dump Valve

It is important to make sure that the dump valve is functioning properly. This valve dumps mineral laden water out the dump hose.



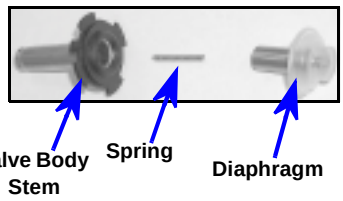
The ice may become mushy if the valve does not open properly. If the valve sticks open, it will cause a longer freeze cycle.

1. Remove wire harness from the solenoid coil.
2. Remove blue cap and lift coil off.
3. Check coil resistance. It should be 140 ohms ± 10%.
4. Remove valve body stem by twisting counter-clockwise about 1/8 turn.



5. Disassemble valve body components and check for scale, etc.
6. Clean as necessary and reassemble the valve.

NOTE: A diaphragm kit is available, p/n 165637018.



3. SYRUP

Not applicable for this product.

4. MECHANICAL

4.1 Sealing Ice Bin

If the ice bin is full, new ice will not be able to drop. Instead it blocks the evaporator curtain open and no additional ice is made. This new ice may start to melt and the resulting liquid can leak out of the joint between the ice maker and bin. To prevent this problem, seal the joint with food grade silicon sealant.

NOTE: A bin thermostat is recommended for dispenser applications. When the bin thermostat is satisfied, the ice maker will finish the cycle it is in and shut-down. Part No. bin stat 630000-413

5. REFRIGERATION

5.1 Air Cooled Condensers

Air cooled ice machines add heat to the surrounding environment. In some situations this may over tax the air conditioning system or cause other problems.

Adequate air flow is necessary, including 6 inches (15.2 cm) clearance on the right side and back.

A louvered front and top panel is available for special applications.

Name	322/522	330/530	630/830	1030/1230
Top Panel	164874-016	630200-614	630200-614	630200-614
Front Panel	164873-022	164873-019	164873-020	164873-021

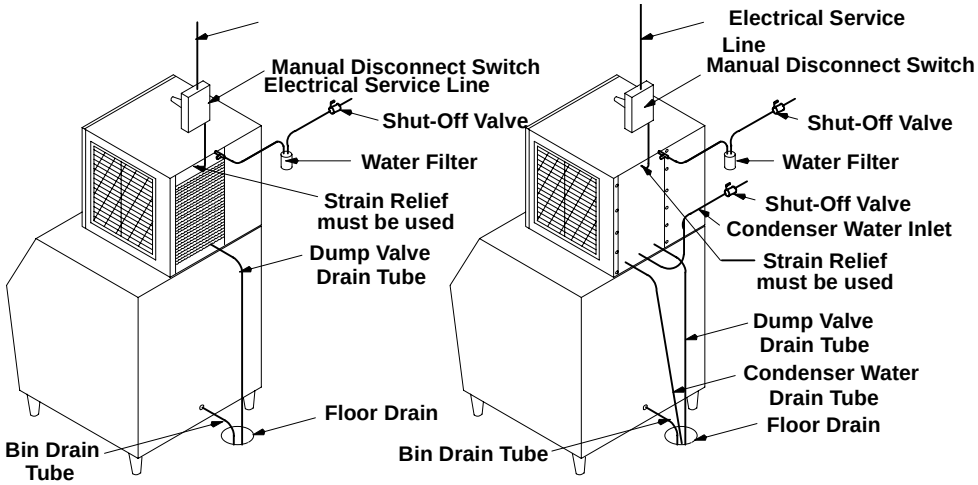
A louvered front and top panel is available for special applications.Air cooled ice machines are not a good choice for industrial applications, or in greasy or dusty environments that could lead to plugged condensers.

On some ice machines a condenser filter is available to trap airborne particles.

5.2 Water Cooled Condensers

Water cooled condensers will significantly increase water and sewer costs.

Water cooled condensers require a dedicated water line with 3/8" (.95 cm) i.d. inlet supplying 20-50 psi (1.4-3.45 BAR) at the ice machine. There should be dedicated water lines for the ice machine and the condenser. These lines should not be teed off of one line..



Use separate lines for the bin drain and the dump valve drain.

It is usually not necessary to filter incoming condenser water.

Follow standard procedures for cleaning condenser lines of scale and deposits.

Water Regulating Valve

The water regulating valve is used on water-cooled ice machines only. The valve is installed in the condenser outlet water line. Its function is to control the proper operating head pressure by regulating the amount of water flowing through the condenser. The valve is adjustable and factory set to maintain condenser discharge water temperature at 108/112° F (42 - 44° C). Setting the water regulating valve to maintain discharge water temperature eliminates the need to enter the sealed refrigeration system. When checking the valve, the water temperature should be taken as close to the condenser discharged as possible. The water temperature will equate to operating head pressure of approximately 275 psi (19.0 BAR).

Should adjustment be required, the valve has an adjustment stem on the top. After allowing the ice machine to operate for 10 minutes in the ice making mode to balance the system, turning the adjustment stem clockwise will increase the discharge water temperature, and counterclockwise will decrease the discharge water temperature.

The water regulating valve must close off condenser water flow completely during the hot gas harvest cycle. There should be no discharge water flowing out of the condenser during the harvest cycle. Should the valve fail to close during the harvest mode, the condenser will continue to condense the compressor discharge vapor needed for the harvest cycle, and this will result in long harvest times.

Leaking (bypassing) water regulating valves are normally the result of scale buildup on the valve diaphragm. The valve should be flushed, not replaced. To flush the valve, open the adjusting stem fully counterclockwise (or force the valve spring up with a screwdriver) and open and close the water supply to the condenser, resulting in the flushing action. Should this not correct the problem, replace the valve diaphragm. This should be done without entering the sealed refrigeration system.

Damage to the water regulating valve may also be caused by a water hammer. Water hammering will result from the condenser inlet and outlet water lines being reversed or defective valve stops in the water supply line. Proper installation of water cooled equipment should always include an anti-water hammer standpipe in the supply inlet line, as close to the ice machine as possible.

5.3 Remote Cooled Ice Machines

Refer to *I Series Ice Cube Machine Service Manual & Maintenance Guide* for remote condenser installation information and correct refrigeration procedures.

NOTE: When installing a remote ice maker, always open the receiver valve after connecting refrigerant lines.

5.4 Refrigeration System

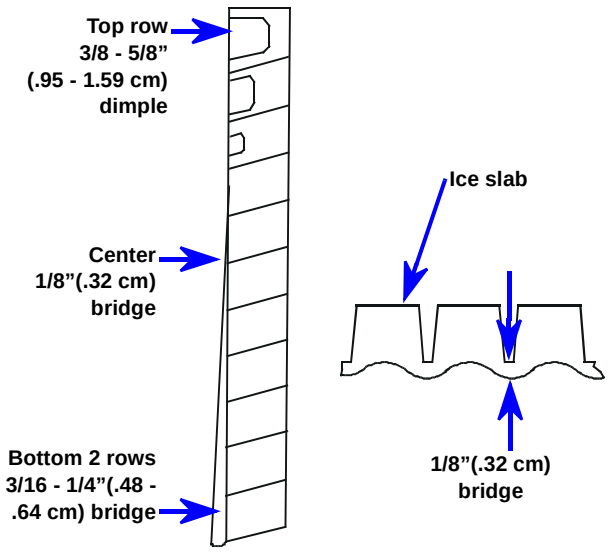
Expansion Valve

The expansion valve is factory set at 6° F (-14° C) superheat (difference between evaporator inlet and outlet). It is non-adjustable. **DO NOT REPLACE WITH AN ADJUSTABLE VALVE**.

Low Refrigerant

Observe ice production. If the refrigerant is low, some of the top evaporator rows do not form ice and freeze times are longer.

For optimum ice production and maximum cube separation, the ice connecting the individual cubes should be a minimum of 1/8 inch (.32cm) thick at the center area of the evaporator.



It is normal for the ice slab to be slightly thicker at the bottom and taper off in a slight wedge pattern at the top. The top row of cubes must have a complete pattern of ice on all four sides and the back wall. Remember, when you operate the product with the panels off during testing the additional heat at the top of the evaporator will cause thinner ice at the top.

Should a different thickness of the bridge be desired, it will be required to adjust the potentiometer (POT), located on the circuit board.

1. Thinner Bridge - turn the ice thickness POT adjustment screw clockwise one full turn. Allow two cycles before determining if additional adjustments are required.
2. Thicker Bridge - turn the ice thickness POT adjusting screw counterclockwise one full turn. Allow two cycles before determining if additional adjustments are required.

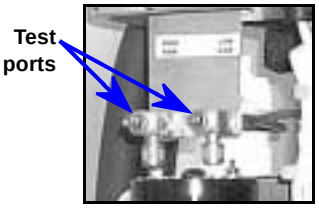
NOTE: Never judge the thickness of the ice from the first batch of the ice produced — the first cycle is a balance cycle. Always wait for the second cycle before making any adjustments.

Refrigerant Charge/Recharge

The refrigeration system is critically charged to within ± 1/2 ounces (14.8 ml), and does not use an accumulator. DO NOT use gauges until all other tests have been performed. Time the freeze cycle and refer to the charts in the *I Series Ice Cube Machine Service Manual & Maintenance Guide*.

NOTE: If water is leaking from the dump valve, warm water is introduced which will increase freeze time.

After conducting all other tests attach gauges and check head and suction pressures.



The ice machine should freeze within ± 10% of the times indicated in the service guide. If the times are longer, find and fix the leak. Then evacuate and recharge the system BY WEIGHT.

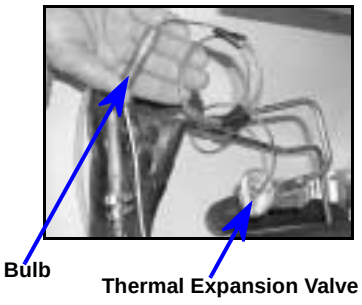
NOTE: The R404A refrigerant used in the I-Series ice machines is a blend of several refrigerants. These can fractionate in the refrigeration system. This is why it is so important to completely evacuate the system before recharging.

NOTE: Always recharge R404A systems in a liquid state (not in a gas state).

NOTE: ALWAYS install a new dryer whenever the refrigeration system has been opened (replace with an EK 404A dryer).

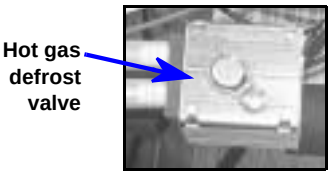
Thermal Expansion Valve (TXV)

Check the TXV by disconnecting the capillary valve from the suction line. Warm the bulb in your hand and watch to see that the valve opens and the suction pressure gauge increases. Cooling the bulb closes the valve.



Hot Gas Defrost Valve

Check that the Hot Gas Defrost Valve is not leaking during the freeze cycle.

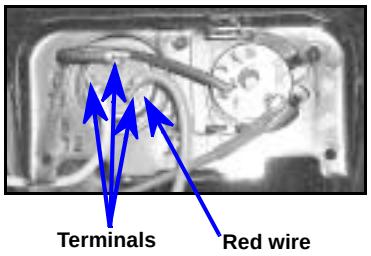


NOTE: The best way to detect a small weeping hot-gas valve, use an electronic sight glass. Alternately, touch the outlet line. If it is warm/hot, it is leaking.

SYSTEM DETAILS

Compressor Start Windings

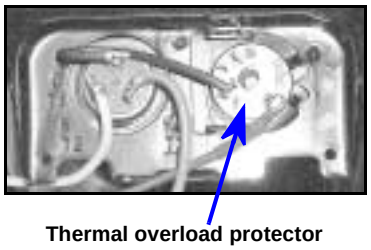
Check the compressor start windings.



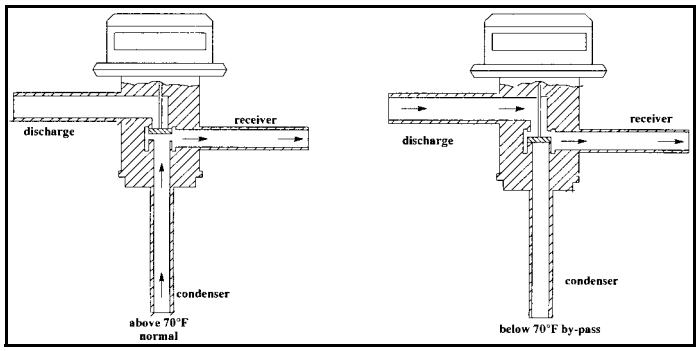
1. With the power disconnected use an ohm meter to check each pair of terminals. There should NOT be an open circuit.
2. Take an amp reading from the red wire during defrost mode. The amps should match those on the name plate. Low amps indicate low refrigerant.
3. Check the voltage at the compressor terminals while the compressor is trying to start. The voltage should be at least 90% of line voltage.
4. Refer to the *I Series Ice Cube Machine Service Manual & Maintenance Guide* for additional compressor starting tests.

Thermal Overload Protector

Check the Thermal Overload Protector by disconnecting one of the wires and checking for continuity (make sure the compressor has cooled).



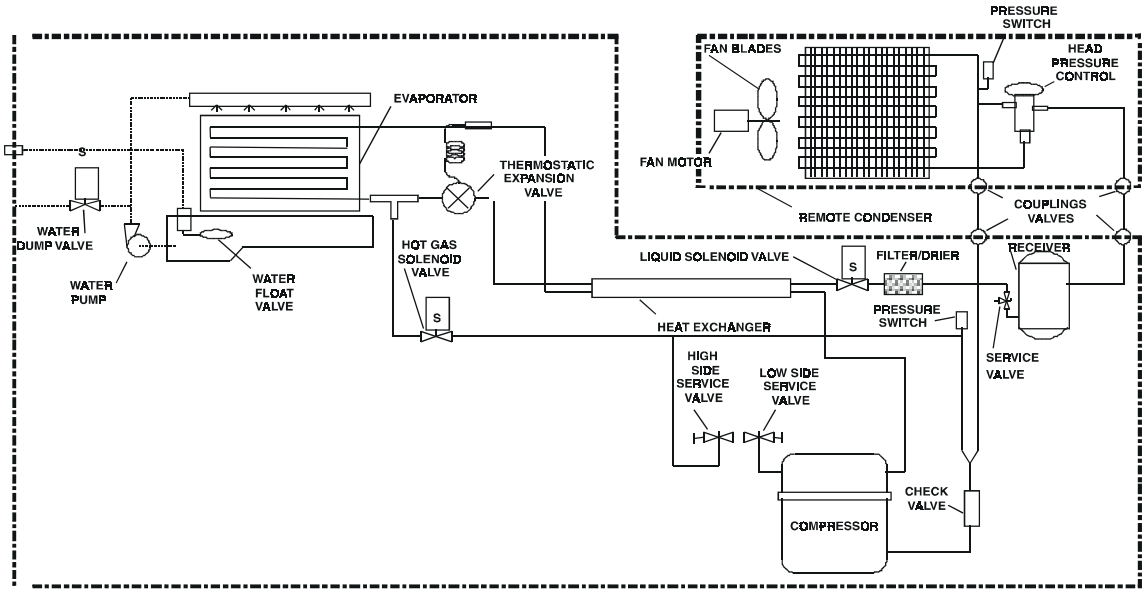
Head Pressure Control



The Cornelius "I" series remote systems use an Alco Head Pressure Control, normally referred to as a headmaster. This control is mounted in the remote condenser with a fan cycling control switch. Using both these controls gives the system positive operation under a wide range of condensing temperatures.

The normal flow pattern through the headmaster is from the condenser port to the receiver port. When this flow pattern is unable to maintain a receiver outlet pressure equal to or above the dome pressure setting of the valve, the dome pressure will force the valve port to change, closing the condenser port and opening the bypass port from the compressor discharge line. This allows the high pressure vapor from the discharge port to "buck" the receiver pressure back up. With the condenser port closed, the refrigerant is backed up in the condenser, basically reducing the condenser size, assisting in maintaining the discharge port flow, and increasing the head pressure.

The head pressure control valve (headmaster) maintains adequate condensing pressure during periods of low ambient temperature. The I-Series ice makers are charged with R404A refrigerant. The headmaster valve is set to maintain a condensing pressure of 200 psig (13.8 BAR) down to an operating temperature of -20°F (-6.7° C).



Touching the lines of the headmaster will determine the flow path the headmaster is in; condenser to receive, or bypass to receiver. Installing a gauge at the receiver outlet valve will determine if the headmaster is functioning to maintain the proper operating pressure. It should be less than 15 psi (1.0 BAR). Less pressure indicates low refrigerant or kinked lines.

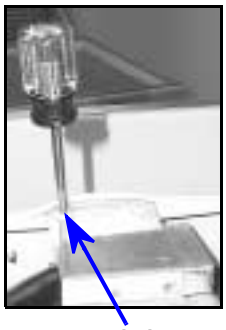
Refer to the *I Series Ice Cube Machine Service Manual & Maintenance Guide* for additional head pressure control information.

5.5 Suction Line Thermistor Replacement

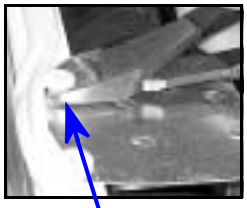
NOTE: The following procedure may be the easiest, but, it is not the only way replace the thermistor.

1. Unplug the ice machine and remove the top and front panels.

2. Remove plastic rivets from the electrical box mounting bracket using a punch and side cutters. Save the rivets for reinstallation.

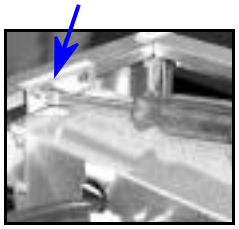


Punch thru center of rivet

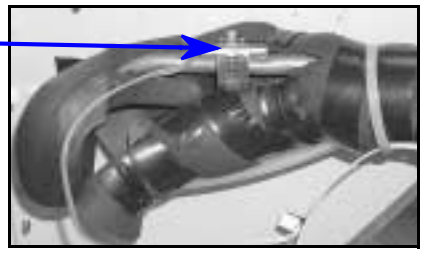


Side cutters to lift rivets Do Not Cut

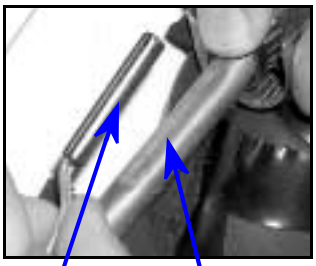
3. Remove and retain four screws on top of bracket and two on gauge port bracket.



4. Move electrical box out of the way and cut insulation from around the thermistor.



5. Replace thermistor. Be sure to clean the surface of the suction line.



SYSTEM DETAILS

6. Reassemble, making sure the new thermistor is in the proper location. **Replace the insulation around the thermistor or the ice machine will not function properly.**

6. CONTROLS AND ELECTRICAL

6.1 Controls Board Features (Red and Yellow Boards)

- 4 second power-up sequence, adjusts board to correct voltage and Hertz before the compressor starts
- Push button test mode
- 8 inline power connectors
- Bridge adjustment range indicator
- Dip switch selectors for curtain switches 1-4
- Dip switch selector for dump cycles
- Circuit board will retrofit for service replacements

TROUBLE SHOOTING

1. Issues Affecting All Circuit Boards

1.1 Reset Operation

When ice machine is shutdown and Error-LED is operational, the ice machine power switch must be turned OFF for approximately 5 seconds and returned to the ON position to reset the circuit board and allow the ice machine to restart operation.

1.2 Evaporator Proximity Switches

Proximity switches are mounted to the evaporator and the magnet is mounted to water curtain.

Switch Notes:

- Manually holding the curtain open for approximately 5 seconds during freeze mode will shut the ice machine down.
- With dual-evaporator machines, both right hand and left hand switches must open and reset to start the next freeze cycle.

1.3 Harvest Safety Termination (Red and Yellow Boards)

After 4 minutes in harvest mode, the safety timer in the circuit board will terminate the harvest mode and place the ice machine in freeze mode. This safety cycle will protect the evaporator, etc. should the harvest mode not terminate. Three consecutively failed harvests will result in a solid red Error-LED, which requires a manual reset.

1.4 Stacking Cable

When two I-series ice machines are stacked, a cable is used to connect their circuit boards. This allows the bottom unit to be shut down on a Full Bin Signal (or other error code). The top unit will finish the cycle it is in, and shut down.

The circuit board stacking connection can be used for the stacking cable or for a bin thermostat, but not for both.

The I-series machines should never be stacked more than two high.

1.5 Ice Bridge Thickness Adjustment

1. Thinner Bridge - turn the ice thickness POT adjustment screw clockwise one full turn. Allow two cycles before determining if additional adjustments are required.

2. Thicker Bridge - turn the ice thickness POT adjusting screw counterclockwise one full turn. Allow two cycles before determining if additional adjustments are required.

NOTE: Never judge the thickness of the ice from the first batch of the ice produced — the first cycle is a balance cycle. Always wait for the second cycle before making any adjustments.

1.6 Condenser Fan Cycling Control

The condenser fan on air cooled ice machines is cycled by the circuit board. The condenser sensor signals the circuit board when the condenser temperature reaches 100° F (38° C). The fan starts and continues to run until the temperature is reduced to 88° F (31° C).

NOTE: Integral condenser ice machines do not use pressure to cycle the condenser fan motor.

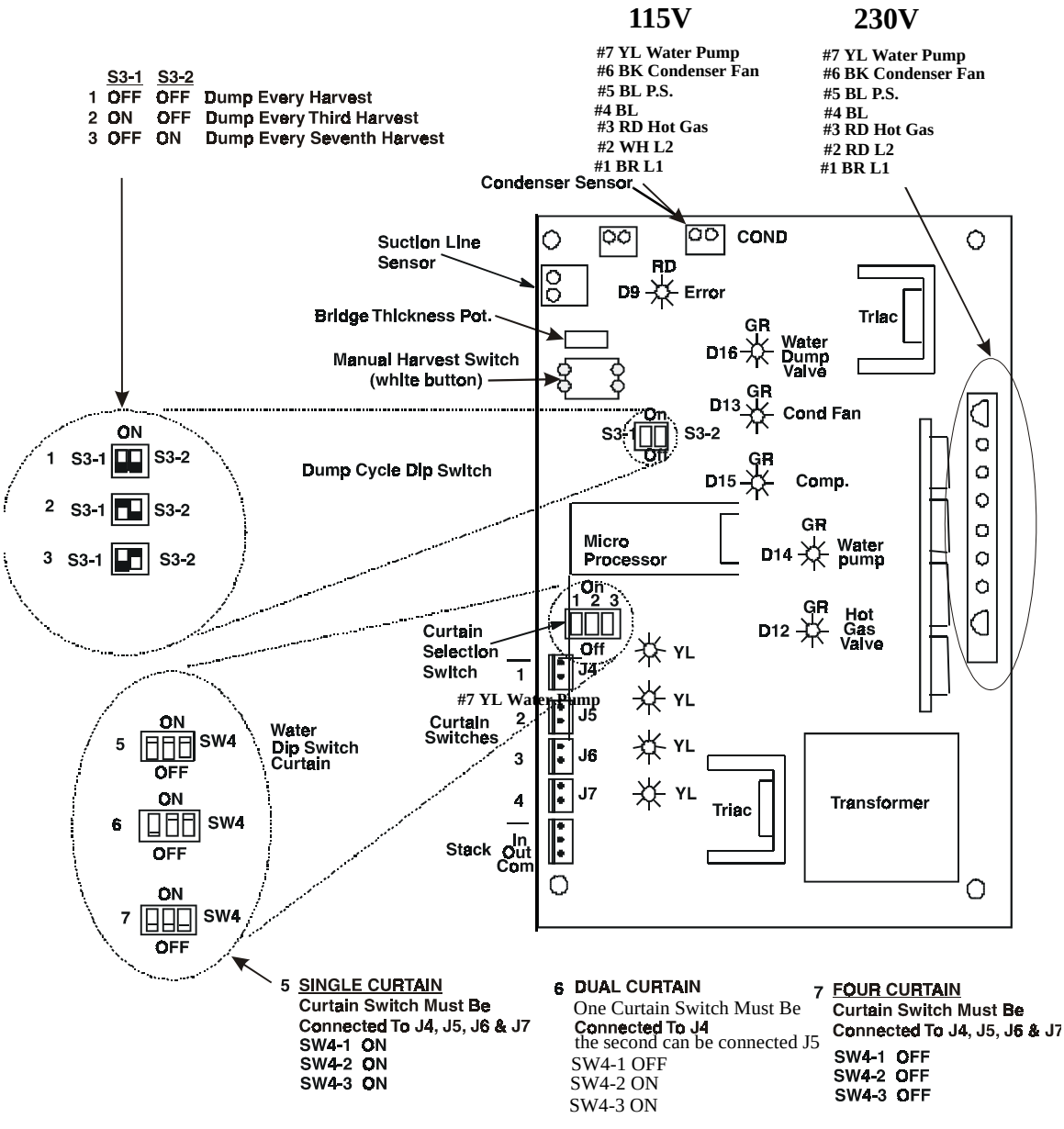
NOTE: Remote condenser units use a fan cycling pressure switch. "ON" 280 PSI (19.3 BAR), "OFF" 230 PSI (15.9 BAR).

1.7 Sensor

Premature harvest is normally caused by a defect in suction line sensors!

If the ice machine will not go into harvest, the suction line temperature must be checked (approximately 0° F (-18° C)!

2. CIRCUIT BOARD OVERVIEW (RED & YELLOW BOARDS)



SERVICE

2.1 Red & Yellow Boards (LEDs) Descriptions

Status Indicators			
D1-2 D3-4	Yellow LED	Water curtain(s) dip switch can be set for 1, 2, or 4 evaporator machines	
D9	Red LED	Error	
D12	Green LED	Hot gas valve(s)	
D13	Green LED	Condenser fan	
D14	Green LED	Water pump	
D15	Green LED	Compressor contactor	
D16	Green LED	Dump valve	
Water Curtain(s) Open			
D1-2	Yellow LED	ON	Curtain(s) closed
D3-4	Yellow LED	OFF	Curtain(s) open
Pre-Chill Mode			
D1-2 D3-4	Yellow LED	ON	Water curtain(s) closed
D13	Green LED	ON or OFF	Condenser fan cycles on and off depending on condenser temperature
D15	Green LED	ON	Contactor closed
Ice Making Mode			
D1-2 D3-4	Yellow LED	ON	Water curtain(s) closed
D13	Green LED	ON or OFF	Condenser fan cycles on and off depending on condenser temperature
D14	Green LED	ON	Water pump actives when the evaporator is at 20° F (-7° C) or lower, except during dump cycle
D15	Green LED	ON	Compressor contactor closed
Harvest Mode			
D1-2 D3-4	Yellow LED	ON	Water curtain(s) closed

D14	Green LED	ON 15 seconds	Water pump active for 15 sec., then inactive
D15	Green LED	ON	Compressor contactor closed (compressor active)
D16	Green LED	ON 15 seconds	Dump valve active 15 sec.
Error-LEDs			
D9	Red LED		Turns on when the system is shutdown
D9	Red LED	ON or flashing	Assists to indicate where the error may be and or what may have caused the error
D9	Red LED	ON	Evaporator temp. drops below -25° F (-32° C) – the system will shutdown for 30 min's and attempt to restart 2 times before shutting down
D9	Red LED	ON	Open thermistor circuit – thermistor open/ broken or wire/poor connector
D9	Red LED	ON	High evaporator temperature – evaporator does not fall below 40° F (4° C) within 6 minutes into freeze cycle – requires manual reset
D9	Red LED	ON	3 failed harvest cycles (when no ice drops)
D9	Red LED	Flashing 1/2 sec. ON, 1/2 sec. OFF	Open sensor or high temperature shutdown – condenser temp. exceeds 150° F +2°, -6° (66° C +1°, -3°) – the system will shutdown for 30 min's and attempt to restart 2 times before shutting down
D9	Red LED	Flashing 1/4 sec. ON, 1/4 sec. OFF, 1 sec. delay, then repeat	Low temperature shutdown – condenser temp. drops to 36° F ±2° (2° C ±1°) – the ice machine will restart if temp. rises to 40° F ±2° F (1° C)
D9	Red LED	Flashing 1/4 sec. ON, 1/4 sec. OFF,	Within one turn of either end of the potenti-ometer range

SERVICE

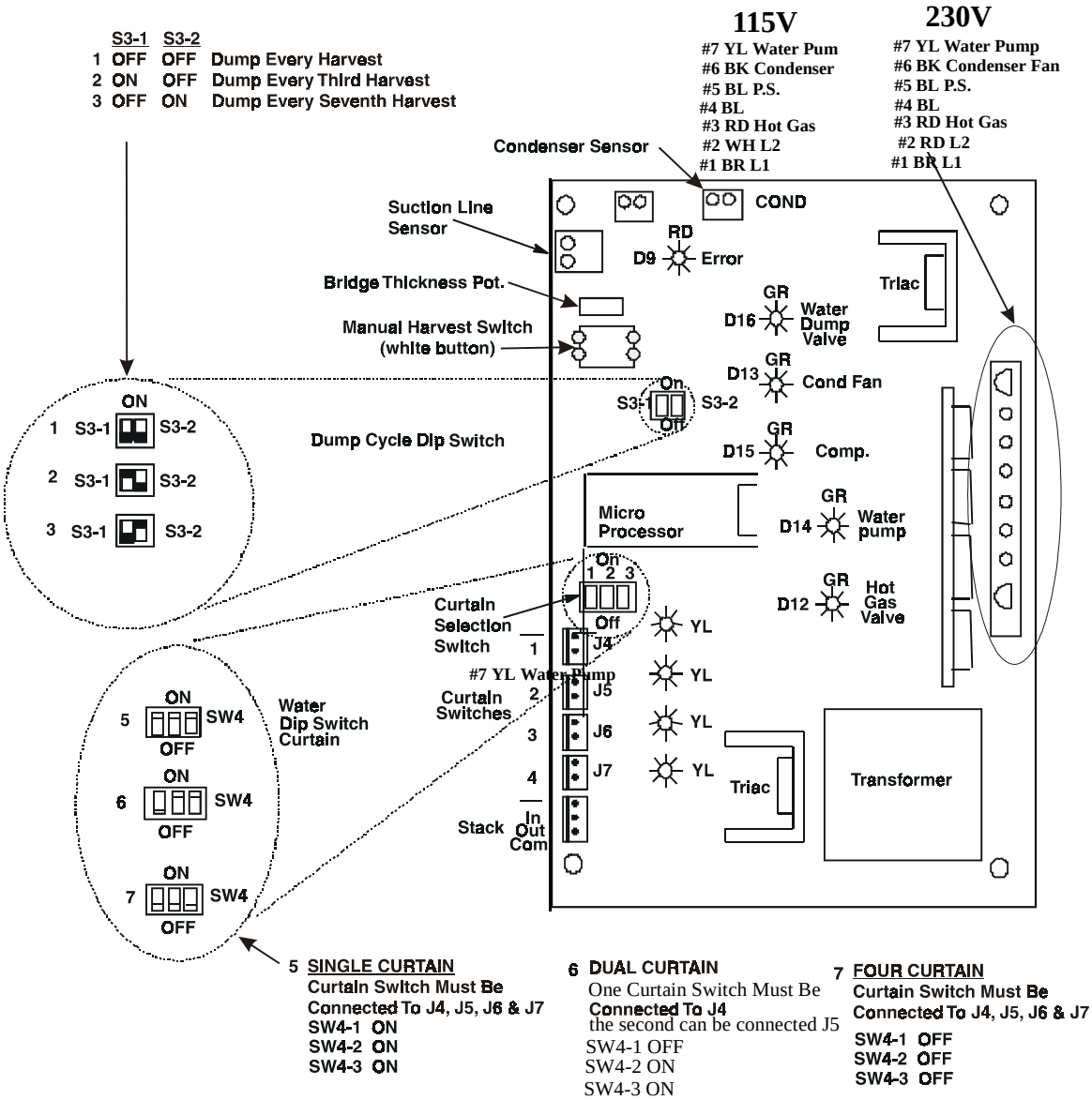
3. Red & Yellow Board Diagnostics

With ice machine in freeze cycle, push and hold the Hot Gas Manual Harvest/Defrost Button until circuit board goes into diagnostic mode (about 3 seconds). The ice machine starts to cycle these five components:

1. Hot Gas Solenoid
2. Water Pump
3. Contactor
4. Fan Motor
5. Dump Valve.

Check to make sure the proximity switch lights are on.

When replacing the circuit board make sure the dip switches are set correctly.



SERVICE

3.1 Sensors

The suction line sensor (blue) is a thermistor rated at 2815 ohm ± 5%, at 32° F (0° C). This sensor controls the ice bridge thickness by measuring the suction line temperature and sending it to the circuit board. The circuit board controls the compressor.

If the suction line temperature does not drop to 40° F (4.4° C) in 6 minutes, the ice machine goes into a safety shutdown mode. A manual reset must be performed.

3.2 Check Circuit Board Output

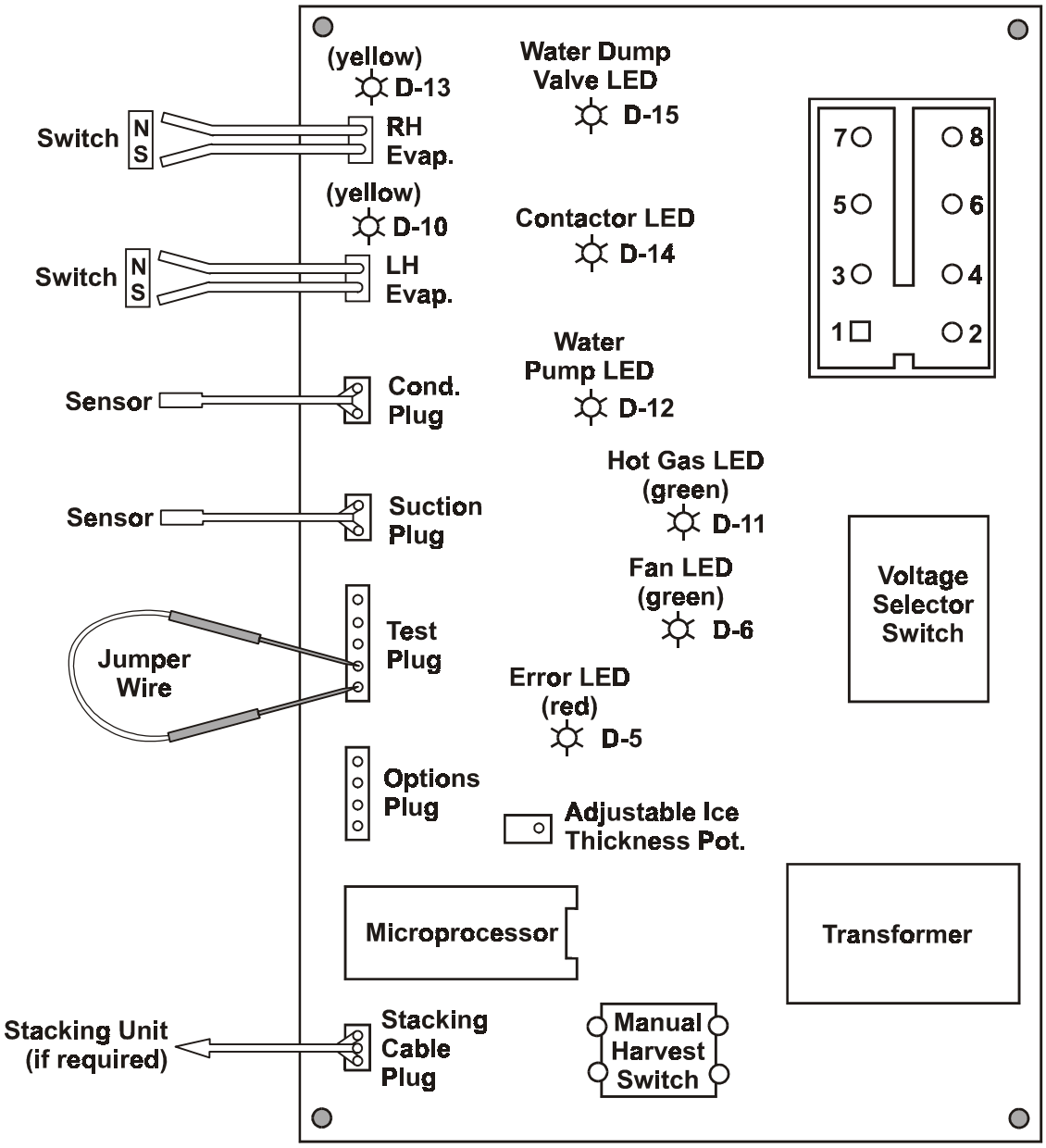
1. Turn ice machine power switch OFF. Disconnect sensor plug from board.
2. Turn power switched ON.
3. Use digital multimeter set for DC voltage. Connect leads of meter across the two pins of the sensor being checked.
4. Meter should read 4.5–5.0 VDC. If voltage is not correct, replace the circuit board.

Note: This also applys to the proximity switch

3.3 Check Thermistor Sensor(s)

1. Disconnect the suction line sensor from the control board.
2. Install a special test cord (p/n 164984009) to the controller board.
3. Reinstall the suction line sensor.
4. Set the multimeter for DC-volts and connect it to the special test cord leads.
5. Operate the ice machine in freeze cycle.
6. As the suction line temperature decreases the volt reading should increase.
   - If the multimeter reading remains steady and does not increase, it indicates a shorted sensor. Replace the sensor and check again.
   - If the multimeter reading is 4.5 – 5.0 VDC it indicates an open sensor. Replace the sensor and check again.

4. GREEN CIRCUIT BOARD OVERVIEW



4.1 GREEN BOARD Test Plug

This plug is primarily for the manufacture's use.

SERVICE

4.2 GREEN BOARD Sensors

Condenser sensor and suction line sensor are thermistors rated at 2815 ohms ± 5% at 32° F (0° C).

Condenser Sensor signals the circuit board for fan cycling, and serves as the high-temperature safety shutdown. The Error-LED will flash once a second during high temperature safety shutdown. Manual reset must be performed to restart "ON" at 100°F, "OFF" at 88°F

Suction Line Sensor signals the circuit board about the suction line temperature. This controls the ice bridge thickness. The ice machine has 6 minutes to reduce suction line temperature to 40° F (4.4° C) in the freeze mode (Error-LED is ON) before a safety shutdown. Manual reset must be performed to restart at 150°F.

4.3 GREEN BOARD Voltage Check

1. Turn ice machine power switch OFF.
2. Disconnect proximity switch plugs from the control board.
3. Set the multimeter for DC volts and connect leads to the top 2 pins of the right hand and left hand evaporator.
4. Turn ice machine power switch ON.
5. Meter should read 5 VDC ± .2 VDC. If not, replace circuit board.

4.4 GREEN BOARD Thermistor Sensor Diagnostics

Check Circuit Board

1. Turn ice machine power switch OFF. Disconnect sensor plug from board.
2. Use digital multimeter set for DC voltage. Connect leads of meter across the two test plug pins of the sensor being checked.
3. Turn power switched ON.
4. Meter should read 2.5 ± .2 VDC. If voltage is not correct, replace the circuit board.

Check Thermistor Sensor(s)

1. Disconnect the suction line sensor (brown) from the control board.
2. Install a special test cord (p/n 164984009) to the controller board.
3. Reinstall the suction line sensor.
4. Set the multimeter for milli-volts DC and connect it to the special test cord leads.
5. Operate the ice machine in freeze cycle.

6. As the suction line temperature decreases the milli-volt reading should increase.
   - If the multimeter reading remains steady and does not increase, it indicates a shorted sensor. Replace the sensor and check again.
   - If the multimeter reading is 2.5 VDC it indicates an open sensor. Replace the sensor and check again.

4.5 Sensors

The suction line sensor is a thermistor rated at 2815 ohm ± 5%, at 32° F (0° C). This sensor controls the ice bridge thickness by measuring the suction line temperature and sending it to the circuit board. The circuit board controls the compressor.

If the suction line temperature does not drop to 40° F (4.4° C) in 6 minutes, the ice machine goes into a safety shutdown mode. A manual reset must be performed

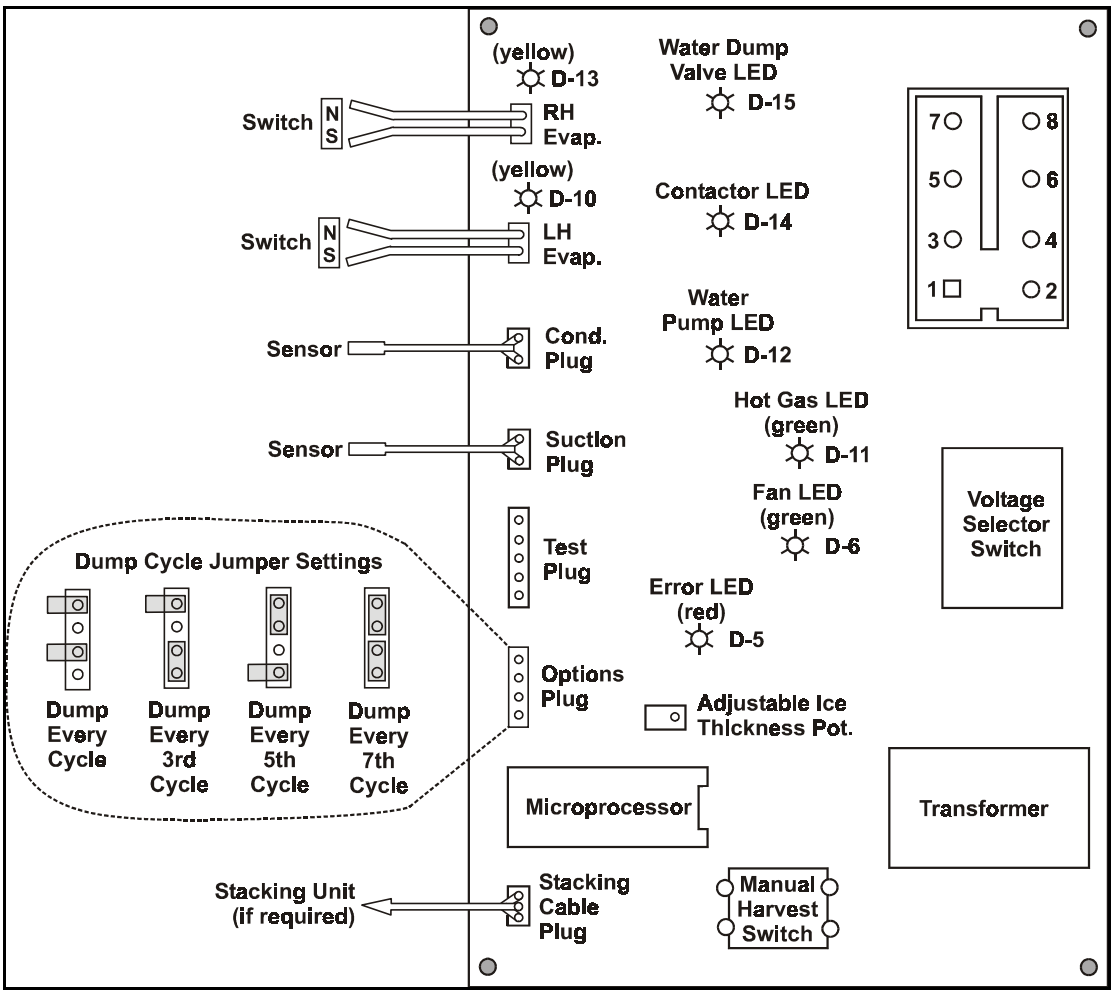
4.6 GREEN BOARD Voltage Selector Switch

- Selector bar in **CENTER** position - - - switch is **OPEN** (ice machine is inoperative)
- Selector bar **DOWN** - - - - - - - - - - **115 VAC** selected
- Selector bar **UP** - - - - - - - - - - - - **230 VAC** selected

4.7 GREEN BOARD Ice Bridge Thickness Potentiometer (POT) Factory Reset

1. Turn voltage selector switch OFF (center position).
2. Unplug proximity switches and thermistor(s) from circuit board.
3. Turn voltage selector switch ON.
4. Momentarily short across the bottom two pins of the test plug with a wire jumper or screw driver.
   - If the POT is within the factory setting the D-5 LED will flash continuously.
   - If the POT is NOT within the factory setting the D-5 LED will NOT light.
5. If the D-5 LED is not lit, slowly turn the adjuster clockwise until it lights. If the LED does not light after 10 turns, turn the adjuster counterclockwise until it lights.

4.8 GREEN BOARD Dump Cycle Options



SERVICE

4.9 GREEN BOARD Diagnostics

Erratic Component Operation

Erratic component operation (water pump, condenser fan, hot gas valve, etc.) are often the result of a poor connection to the 8-pin connector. Before performing diagnostics on the circuit board, make sure the 8-pin connector is securely in place.

Check Circuit Board

1. Turn the power switch ON. The D-5 Error-LED indicator will be illuminated for 2 seconds.
2. After the D-5 Error-LED goes out, momentarily short across the bottom two terminals out of the test plug with a jumper wire or screwdriver. Then remove the jumper. The circuit board is now in test mode.
3. One of these two conditions will exist:
   - If the ice thickness potentiometer is within the factory setting, the Error-LED will flash continuously.
   - If the ice thickness potentiometer is not within the factory setting, the Error-LED will not be lit.
4. In either case, the green LED indicators will illuminate for 2 seconds in the sequence shown below. They will continue to sequence until the power is turned off. Failure of the green LEDs to cycle in this sequence indicates a defective circuit board. Replace the board.

Status Indicators		
D6	Green LED	Fan
D11	Green LED	Hot gas valve(s)
D12	Green LED	Water pump
D14	Green LED	Contactor
D15	Green LED	Dump valve

SERVICE

APPENDIX

APPENDIX A — SERVICE TIPS

- Use nickel safe cleaner when cleaning evaporators.
- Use only Cornelius parts in servicing ice makers.

APPENDIX B — INSTALLATION TIPS

- Purge water lines.
- Level the ice machine.
- Seal the ice maker to the bin or dispenser.
- Use a dedicated electrical circuit with proper sized wire and breaker.
- Provide adequate clearance.
- Fasten the ice maker to the bin or adapter.

REVIEW

DATE: _____

NAME: _____

LOCATION: _____

REVIEW

General Ice Maker Installation

The following questions summarize important points in this training lesson

1. What is the minimum and maximum ambient temperatures for a ice maker installation.
   ___A. 25° F to 60° F
   ___B. 50° F to 100° F
   ___C. 72° F ±10° F
   ___D. Ice machines can be successfully installed in any ambient.
2. Inlet water pressures
   ___A. Are not important since the float can accomodate any municipal water pressure.
   ___B. Should not exceed 50 PSI.
   ___C. Can be maintained with a water pressure regulator.
   ___D. B and C.
3. Sealing the ice maker head to the ice bin or dispenser with approved sealant is
   ___A. Necessary only in areas subject to high humidity.
   ___B. The approved method od sealing the ice machine to the bin or dispenser.
   ___C. Required to meet sanitation codes.
   ___D. To eliminate leaks.
   ___E. C and D.
4. Proper air circulation is provided with a minimum clearance of
   ___A. 6 inches minimum
   ___B. 9 inches minimum
   ___C. 2.5 inches minimum

Ice Cuber Operation

5. What refrigerant is used in the “I” series cube ice maker
   ___A. R404a

   ___B. R22

   ___C. R12

   ___D. HP62

6. On a air cooled cuber, thermistors are located at the following locations:
   ___A. Evaporator, condenser, and suction line.

   ___B. Condenser and suction line.

   ___C. Dump valve, hot gas valve, and evaporator.

7. The thermostatic expansion valve is
   ___A. Nonadjustable.

   ___B. Internally adjustable.

   ___C. Externally adjustable.

   ___D. automatically adjustable.

8. Circuit board problem diagnosis (check all that are true)
   ___A. Circuit boards cannot be diagnosed and must be replaced.

   ___B. Circuit board failure will automatically illuminate error LED.

   ___C. Circuit board is self correcting.

   ___D. Can be checked by the self-diagnostics built into the board.

   ___E. B and D.

9. Ice bridge thickness should be checked at
   ___A. The top of evaporator.

   ___B. The bottom of evaporator.

   ___C. The center of evaporator.

   ___D. Anywhere in the evaporator.

10. Which component(s) could be checked if the machine fails to shut off when the bin is full?
    ___A. The evaporator sensor.

    ___B. The bin thermostat.

    ___C. The proximity switch

    ___D. All of the above.

11. When the evaporator curtain is moved away from the evaporator
___A. The machine will return to the freeze cycle if the bin is not full.

___B. The machine will shut down.

___C. A malfunction of the curtain is indicated and it must be replaced.

___D. Both A and B.

12. When the machine enters the defrost cycle, which components are energized?
___A. Compressor, condenser fan, and the hot gas solenoid.

___B. Hot gas solenoid and the dump valve only.

___C. Only the hot gas solenoid.

___D. Compressor, hot gas solenoid, and the dump valve.

13. An air cooled condenser
___A. Is self cleaning.

___B. Must be kept clean.

___C. Cleaning can be reduced if filter is installed.

___D. Both B and C.

14. The three basic circuits of the ice machine are
___A. Air, water and refrigeration.

___B. Mechanical, electrical and plumbing

___C. Water, electrical and refrigeration.

15. If the unit is shut down and the red error light is flashing,
___A. The unit is off because the evaporator curtain is open.

___B. The unit is off because the suction temperature is below 40° F.

___C. The unit is off because the condenser temperature is above 150° F.

___D. The unit is off because of high amp. draw on the compressor.

16. Most problems encountered on an ice machine are caused by
___A. Refrigeration leaks.

___B. Improper installation.

___C. Lack of periodic maintenance.

___D. Defective component parts

___E. Both A and E.

17. Proper sanitation procedures for cleaning of the storage bin requires all ice to be removed from the storage bin.
___A. True.

___B. False.

18. When the cuber is shut down and the red LED is illuminated, to reset
___A. Push the reset button.

___B. Close the proximity switch.

___C. Turn the power switch off at least 5 seconds.

___D. The board automatically resets after 2 minutes.

19. To test the board for proper proximity switch operation, the voltage reading across the switch terminal is
___A. 2.5VDC

___B. 2.5VAC

___C. 5VDC

___D. 5VAC

AVERAGE OPERATING CHARACTERISTICS IACS 227/IAC 322/IAC 330

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	200	39	9:5	150	105	1:1	2.4	325
80	70	228	42	12:4	160	110	0:9	2.4	260
90	70	267	44	14:3	183	133	0:7	2.5	240
90	80	270	45	15:1	181	130	0:7	2.4	220
100	70	299	47	19:8	199	142	0:6	2.8	200

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1379	269	9:5	1034	724	1:1	1.1	147
27	21	1572	290	12:4	1103	758	0:9	1.1	118
32	21	1841	303	14:3	1262	917	0:7	1.1	109
32	27	1862	310	15:1	1248	896	0:7	1.1	100
38	21	2062	324	19:8	1372	979	0:6	1.3	91

AVERAGE OPERATING CHARACTERISTICS IWCS 227/IWC 322/IWC 330

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	300	40	12:1	143	103	0:9	2.8	310
80	70	300	42	15:3	160	116	1:1	2.8	245
90	70	300	43	16:2	160	118	1:2	2.9	240
90	80	303	44	16:4	173	120	1:1	2.8	230
100	70	300	44	16:3	160	117	1:3	2.6	215

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	2068	276	12:1	986	710	0:9	1.3	141
27	21	2068	290	15:3	1103	800	1:1	1.3	111
32	21	2068	296	16:2	1103	814	1:2	1.3	109
32	27	2089	303	16:4	1193	827	1:1	1.3	104
38	21	2068	303	16:3	1103	807	1:3	1.2	98

AVERAGE OPERATING CHARACTERISTICS IAC 522/IAC 530

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	220	38	12:5	155	95	1:0	5.1	540
80	70	250	42	14:6	175	111	0:9	4.8	450
90	70	275	41	17:4	195	120	0:7	5.1	405
90	80	290	45	17:9	200	120	0:6	5.0	387
100	70	320	46	20:9	220	120	0:6	5.2	350

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1517	262	12:5	1069	655	1:0	2.3	245
27	21	1724	290	14:6	1207	765	0:9	2.2	204
32	21	1896	283	17:4	1344	827	0:7	2.3	184
32	27	1999	310	17:9	1379	827	0:6	2.3	176
38	21	2206	317	20:9	1517	827	0:6	2.4	159

AVERAGE OPERATING CHARACTERISTICS IWC 522/IWC 530

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	323	44	11:3	156	106	1:3	4.3	490
80	70	327	45	13:7	168	115	1:2	4.4	425
90	70	326	45	13:8	173	117	1:1	4.3	420
90	80	328	47	15:2	184	127	1:1	4.3	384
100	70	327	45	13:9	175	119	1:1	4.3	415

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	2227	303	11:3	1076	731	1:3	1.9	222
27	21	2255	310	13:7	1158	793	1:2	2.0	193
32	21	2248	310	13:8	1193	807	1:1	2.0	191
32	27	2261	324	15:2	1269	876	1:1	2.0	174
38	21	2255	310	13:9	1207	820	1:1	2.0	188

AVERAGE OPERATING CHARACTERISTICS IAC 630

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	225	34	8:4	148	88	1:5	5.4	755
80	70	261	37	11:3	166	101	1:2	5.6	640
90	70	296	40	12:6	183	113	1:1	5.6	590
90	80	297	40	13:2	184	113	1:0	5.5	560
100	70	333	43	17:1	200	125	1:1	6.0	475

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1551	234	8:4	1020	607	1:5	2.4	342
27	21	1800	255	11:3	1145	696	1:2	2.5	290
32	21	2041	276	12:6	1262	779	1:1	2.6	268
32	27	2048	276	13:2	1269	779	1:0	2.5	254
38	21	2296	296	17:1	1379	862	1:1	2.7	215

AVERAGE OPERATING CHARACTERISTICS IWC 630

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	299	35	10:1	143	86	1:6	5.8	715
80	70	299	38	12:4	152	92	1:4	6.0	622
90	70	300	38	12:3	153	93	1:4	5.9	620
90	80	304	39	14:0	166	100	1:2	6.0	570
100	70	300	38	12:2	152	93	1:4	5.8	615

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	2062	241	10:1	986	593	1:6	2.6	324
27	21	2062	262	12:4	1048	634	1:4	2.7	282
32	21	2068	262	12:3	1055	641	1:4	2.7	281
32	27	2096	269	14:0	1145	689	1:2	2.7	259
38	21	2068	262	12:2	1048	641	1:4	2.6	279

AVERAGE OPERATING CHARACTERISTICS IRC 630

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	225	34	8:4	148	88	1:5	5.2	755
80	70	261	37	11:3	166	101	1:2	5.6	640
90	70	296	40	12:6	183	113	1:1	5.6	590
90	80	297	40	13:2	184	113	1:0	5.5	560
100	70	333	43	17:1	200	125	1:1	6.0	475

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1551	234	8:4	1020	607	1:5	2.4	342
27	21	1800	255	11:3	1145	696	1:2	2.5	290
32	21	2041	276	12:6	1262	779	1:1	2.6	268
32	27	2048	276	13:2	1269	779	1:0	2.5	254
38	21	2296	296	17:1	1379	862	1:1	2.7	215

AVERAGE OPERATING CHARACTERISTICS IAC 830

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	253	29	7:6	163	83	1:5	5.3	840
80	70	293	33	9:0	187	97	1:0	5.2	745
90	70	335	36	11:5	210	111	0:9	5.8	680
90	80	339	37	12:0	209	111	0:9	5.8	645
100	70	379	40	13:8	232	126	0:8	6.0	595

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1744	200	7:6	1124	572	1:5	2.4	381
27	21	2020	228	9:0	1289	669	1:0	2.3	338
32	21	2310	248	11:5	1448	765	0:9	2.7	308
32	27	2337	255	12:5	1441	765	0:9	2.6	293
38	21	2613	276	13:8	1600	869	0:8	2.7	270

AVERAGE OPERATING CHARACTERISTICS IWC 830

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	298	32	8:6	154	81	1:5	5.6	795
80	70	296	34	10:2	163	86	1:3	5.7	715
90	70	295	34	10:7	164	87	1:3	5.9	710
90	80	298	37	12:1	166	88	1:2	6.0	650
100	70	295	34	11:1	175	93	1:3	5.9	690

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	2055	221	8:6	1062	558	1:5	2.5	361
27	21	2041	234	10:2	1124	593	1:3	2.6	324
32	21	2034	234	10:7	1131	600	1:3	2.7	322
32	27	2055	255	12:1	1145	607	1:2	2.6	295
38	21	2034	234	11:1	1207	641	1:3	2.7	313

AVERAGE OPERATING CHARACTERISTICS IRC 830

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	253	29	7:6	163	83	1:5	5.3	840
80	70	293	33	9:0	187	97	1:0	5.2	745
90	70	335	36	11:5	210	111	0:9	5.8	680
90	80	339	37	12:0	209	111	0:9	5.8	645
100	70	379	40	13:8	232	126	0:8	6.0	595

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1744	200	7:6	1124	572	1:5	2.4	381
27	21	2020	228	9:0	1289	669	1:0	2.3	338
32	21	2310	248	11:5	1448	765	0:9	2.7	308
32	27	2337	255	12:0	1441	765	0:9	2.6	293
38	21	2613	276	13:8	1600	869	0:8	2.7	270

AVERAGE OPERATING CHARACTERISTICS IAC 1030

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	240	33	13:5	164	75	1:7	11.6	1101
80	70	276	36	14:2	177	83	1:4	10.5	969
90	70	312	38	15:9	196	91	1:1	10.5	890
90	80	313	38	16:8	198	91	1:1	10.5	840
100	70	349	41	18:7	215	100	1:0	10.8	793

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1655	228	13:5	1131	517	1:7	5.3	499
27	21	1903	248	14:2	1220	572	1:4	4.8	440
32	21	2151	262	15:9	1351	627	1:1	4.8	404
32	27	2158	262	16:8	1365	627	1:1	4.7	381
38	21	2406	283	18:7	1482	689	1:0	4.9	360

AVERAGE OPERATING CHARACTERISTICS IWC 1030

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	296	34	13:0	155	73	1:8	10.7	1046
80	70	297	35	15:3	161	75	1:7	10.9	925
90	70	297	36	15:7	161	77	1:5	11.0	920
90	80	300	36	17:9	175	81	1:4	11.0	823
100	70	297	36	15:8	164	77	1:5	11.0	915

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	2041	234	13:0	1069	503	1:8	4.9	474
27	21	2048	241	15:3	1110	517	1:7	4.9	420
32	21	2048	248	15:7	1110	531	1:5	5.0	417
32	27	2068	248	17:9	1207	558	1:4	5.0	373
38	21	2048	248	15:8	1131	531	1:5	5.0	415

AVERAGE OPERATING CHARACTERISTICS IRC 1030

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	240	33	13:5	164	75	1:7	11.6	1101
80	70	276	36	14:2	177	83	1:4	10.5	969
90	70	312	38	15:9	196	91	1:1	10.5	890
90	80	313	38	16:8	198	91	1:1	10.5	840
100	70	349	40	18:7	215	100	1:0	10.8	793

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1655	228	13:5	11131	517	1:7	5.3	499
27	21	1903	248	14:2	1220	572	1:4	4.8	440
32	21	2151	262	15:9	1351	627	1:1	4.8	404
32	27	2158	262	16:8	1365	627	1:1	4.7	381
38	21	2406	283	18:7	1482	689	1:0	4.9	360

AVERAGE OPERATING CHARACTERISTICS IAC 1230

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	231	30	8:8	175	75	1:5	8.9	1249
80	70	266	33	11:4	191	84	1:1	9.5	1090
90	70	296	35	13:6	211	95	1:0	10.1	1000
90	80	295	36	14:5	211	93	0:9	10.1	948
100	70	331	38	16:3	232	105	0:9	10.3	865

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1593	207	8:8	1207	517	1:5	4.1	567
27	21	1834	228	11:4	1317	579	1:1	4.3	494
32	21	2041	241	13:6	1455	655	1:0	4.6	454
32	27	2034	248	14:5	1455	641	0:9	4.6	430
38	21	2282	262	16:3	1600	724	0:9	4.7	392

AVERAGE OPERATING CHARACTERISTICS IWC 1230

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	336	30	10:1	187	73	1:4	9.8	1221
80	70	324	30	13:2	177	76	1:3	10.7	1065
90	70	330	33	14:0	180	76	1:3	10.9	1030
90	80	323	32	14:8	180	78	1:3	10.9	973
100	70	324	30	14:0	180	76	1:3	10.9	1025

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	2317	207	10:1	1289	503	1:4	4.4	554
27	21	2234	207	13:2	1220	524	1:3	4.9	483
32	21	2275	228	14:0	1241	524	1:3	5.0	467
32	27	2227	221	14:8	1241	538	1:3	4.9	441
38	21	2234	207	14:0	1241	524	1:3	4.9	465

AVERAGE OPERATING CHARACTERISTICS IRC 1230

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	231	30	8:8	175	75	1:5	8.9	1249
80	70	266	33	11:4	191	84	1:1	9.5	1090
90	70	296	35	13:6	211	95	1:0	10.1	1000
90	80	295	36	14:5	211	93	0:9	10.1	948
100	70	331	38	16:3	232	105	0:9	10.3	865

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1593	207	8:8	1207	517	1:5	4.1	567
27	21	1834	228	11:4	1317	579	1:1	4.3	494
32	21	2041	241	13:6	1455	655	1:0	4.6	454
32	27	2034	248	14:5	1455	641	0:9	4.6	430
38	21	2282	262	16:3	1600	724	0:9	4.7	392

AVERAGE OPERATING CHARACTERISTICS IAC 1448

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	246	31	10:1	185	79	1:3	12.1	1525
80	70	280	34	11:8	201	88	1:3	12.3	1355
90	70	315	35	13:2	220	97	1:1	12.6	1275
90	80	317	37	13:7	222	98	1:1	12.4	1205
100	70	352	38	15:8	242	106	0:8	13.1	1140

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1696	214	10:1	1276	545	1:3	5.5	692
27	21	1931	234	11:8	1386	607	1:3	5.6	615
32	21	2172	241	13:2	1517	669	1:1	5.7	578
32	27	2186	255	13:7	1531	676	1:1	5.6	547
38	21	2427	262	15:8	1669	731	0:8	6.0	517

AVERAGE OPERATING CHARACTERISTICS IWC 1448

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	316	32	9:9	180	73	1:7	12.1	1505
80	70	318	35	11:9	188	77	1:4	12.7	1370
90	70	318	36	12:2	190	78	1:3	12.8	1360
90	80	317	37	13:0	194	80	1:3	12.6	1270
100	70	316	36	12:7	189	77	1:4	13.1	1335

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	2179	221	9:9	1241	503	1:7	5.5	683
27	21	2193	241	11:9	1296	531	1:4	5.8	621
32	21	2193	248	12:2	1310	538	1:3	5.8	617
32	27	2186	255	13:0	1338	552	1:3	5.7	576
38	21	2179	248	12:7	1303	531	1:4	5.9	606

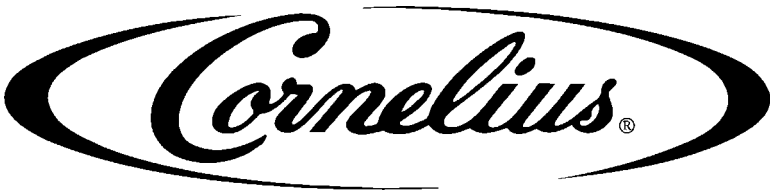
AVERAGE OPERATING CHARACTERISTICS IRC 1448

IP Units

AMBIENT TEMP° F	WATER TEMP ° F	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT lb/Cycle	AVERAGE ICE WEIGHT lb/Day
		HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec	HEAD PRESSURE Psig	SUCTION PRESSURE Psig	CYCLE TIME Min:Sec		
70	50	246	31	10:1	185	79	1:3	12.1	1535
80	70	280	34	11:8	201	88	1:3	12.4	1365
90	70	315	35	13:2	220	97	1:1	12.7	1285
90	80	317	37	13:7	222	98	1:1	12.5	1215
100	70	352	38	15:8	242	106	0:8	13.3	1150

SI Units

AMBIENT TEMP° C	WATER TEMP ° C	FREEZE CYCLE			HARVEST CYCLE			AVERAGE ICE WEIGHT kg/Cycle	AVERAGE ICE WEIGHT kg/Day
		HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec	HEAD PRESSURE kPa	SUCTION PRESSURE kPa	CYCLE TIME Min:Sec		
21	10	1696	214	10:1	1276	545	1:3	5.5	696
27	21	1931	234	11:8	1386	607	1:3	5.6	619
32	21	2172	241	13:2	1517	669	1:1	5.8	583
32	27	2186	255	13:7	1531	676	1:1	5.7	551
38	21	2427	262	15:8	1669	731	0:8	6.0	522



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Part No. TP00919
May 8, 2001

TECHNICAL SERVICES